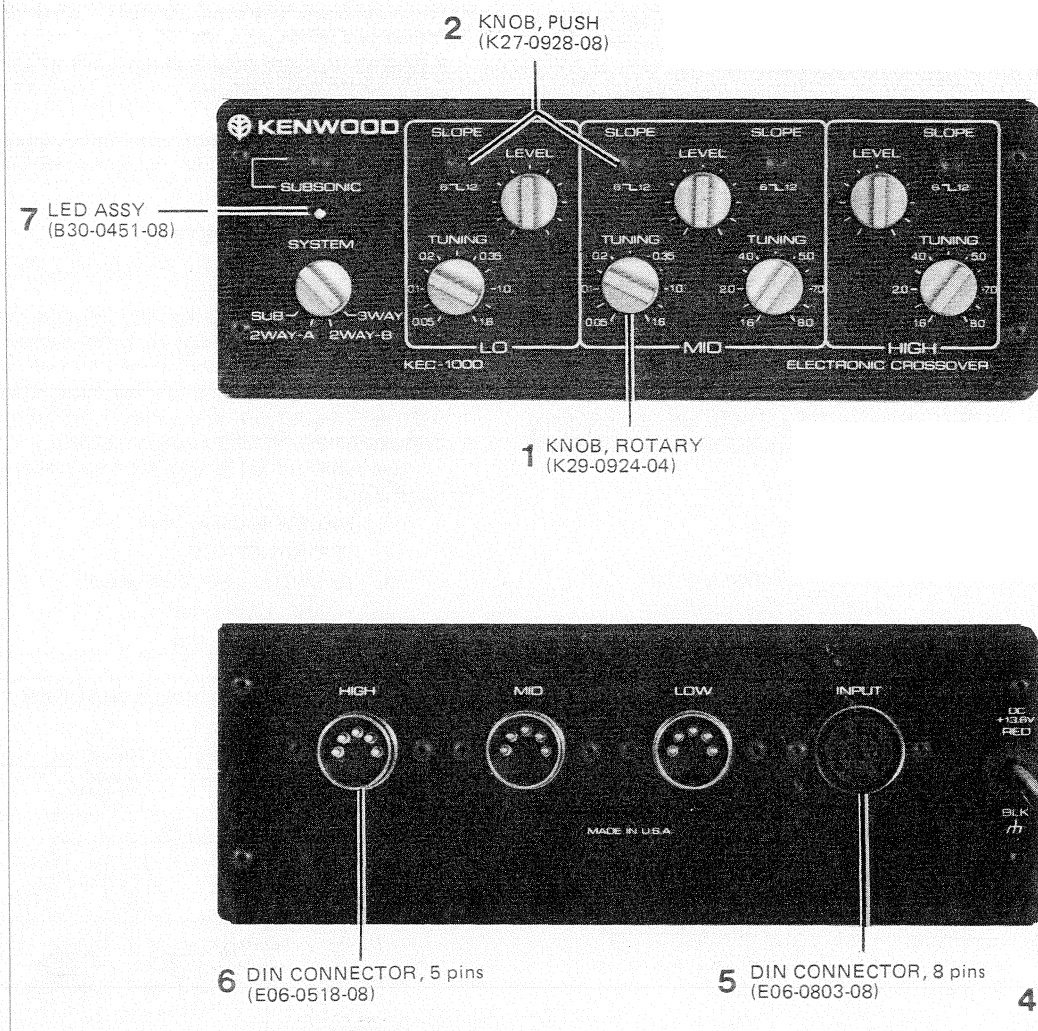
SERVICE MANUAL

KENWOOD®

KEC-1000

ELECTRONIC CROSSOVER



SPECIFICATIONS

INPUT signal level . . . . . maximum 1V
Impedance . . . . . 24K ohm
OUTPUT signal level . . . . . adjustable 0-3V (+10dB)
Impedance . . . . . 150 to 275 ohm
RESPONSE . . . . . 10Hz to 100kHz @ +0/−1.0dB
DISTORTION . . . . . 0.006% @ 1kHz/1V
THD . . . . . 0.04% @ 20Hz−20kHz, 1V output
S/N . . . . . 100dB @ 3V output
SUBSONIC filter . . . . . Frequency = 20Hz (−3dB)
6dB/octave

CROSSOVER POINTS (continuously adjustable)
LO . . . . . 50Hz to 1.6kHz
MID LO . . . . . 50Hz to 1.6kHz
MID HI . . . . . 1.6kHz to 8.0kHz
HI . . . . . 1.6kHz to 8.0kHz
CROSSOVER SLOPE (switchable)
Filters 6dB/octave, 12dB/octave
POWER . . . . . +13.8V, 75mA
DIMENSIONS . . . . . (W) 5¾ (H) 2 (D) 3½ inches
WEIGHT . . . . . 2 lb

C-1000

CIRCUIT DESCRIPTION

The KEC 1000 is a U.S. designed and manufactured Active Electronic Crossover for automotive use, executed to Professional Audio Standards.
(For component designations, refer to schematic Page 4.)

POWER CIRCUIT

The 13.8V (nominal) DC input is coupled through an inline fuse for circuit protection while diode D1 provides protection against damage from power connection reversal.

DC filtration is achieved by inductor L1 and capacitor C1, forming a passive second order low pass filter. A series pass Darlington transistor Q1 is used as power switch, turning on when 12V DC is applied from input connector pin 3, originated by program source equipment. This CONTROL voltage is coupled through a first order low pass filter (R2 and C2) to the base of Q1, here establishing a voltage ramp at the emitter. Upon removal of the control voltage, R1 provides a discharge path for C2.

Capacitor C3 adds DC filtration and energy storage while C4 and C5 contribute localized high frequency power decoupling.

A buffered reference (V_R) is derived from the filtered DC power by a voltage divider (R3 and R4) with C6 providing HF decoupling. OpAmp U7 is connected as a unity gain voltage follower for V_R.

SYSTEM SELECT

Considerations when system selection is made:

A. The position of the System Select switch;
B. The combination of output connectors used.
(The MID-RANGE OUTPUT is always used.)

FIG I: OUTPUT SELECTION

SYSTEM	OUTPUTS		
	LOW	MID	HIGH
SUB	○	○	—
2-A	○	○	—
2-B	—	○	○
3	○	○	○

CIRCLES INDICATE OUTPUT USED IN RESPECTIVE SYSTEM MODES.

In the SUB (woofer) mode the two MID filters are bypassed leaving the MID signal unaffected. The LO signal chain feeds the woofers.

FIG II: ACTIVE FILTERS

FILTER	SYSTEM			
	SUB	2A	2B	3
LOW	○	○	—	○
MID LOW	—	○	—	○
MID HIGH	—	—	○	○
HIGH	—	—	○	○

CIRCLES INDICATE FILTERS USED IN RESPECTIVE SYSTEM MODES.

In 2-WAY A operation, the MID LO filter establishes a crossover match with the LO RANGE filter in the 50 Hz to 1.6kHz tuning range.

2-WAY B selection substitutes the MID HIGH filter, used with the HI RANGE filter and its matching 1.6kHz to 8kHz tuning range.

In the 3-WAY mode both MID filters are used to establish the midrange bandpass of the two crossover points.

SIGNAL PATH AND FILTERS

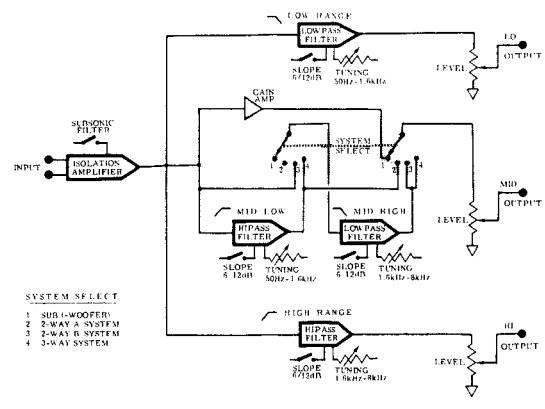
The audio signal is input via connector J1; pin 1 Left, pin 4 Right, and pin 2 Common.

The differential OpAmp U1 provides rejection of unwanted noise which may appear on the input signal lines. The amplifier provides a 4dB voltage gain and combines with a subsonic filter consisting of capacitor C100/C200. When switched into circuit this yields a first order, -6dB/octave highpass filter with -3dB response at 20Hz.

The output of U1 is then split five ways: (see Block Diagram Fig. III).

1. To LOW RANGE filter
2. To GAIN STAGE
3. To SYSTEM SELECT switch
4. To MID LOW filter
5. To HI RANGE filter

FIG III: BLOCK DIAGRAM



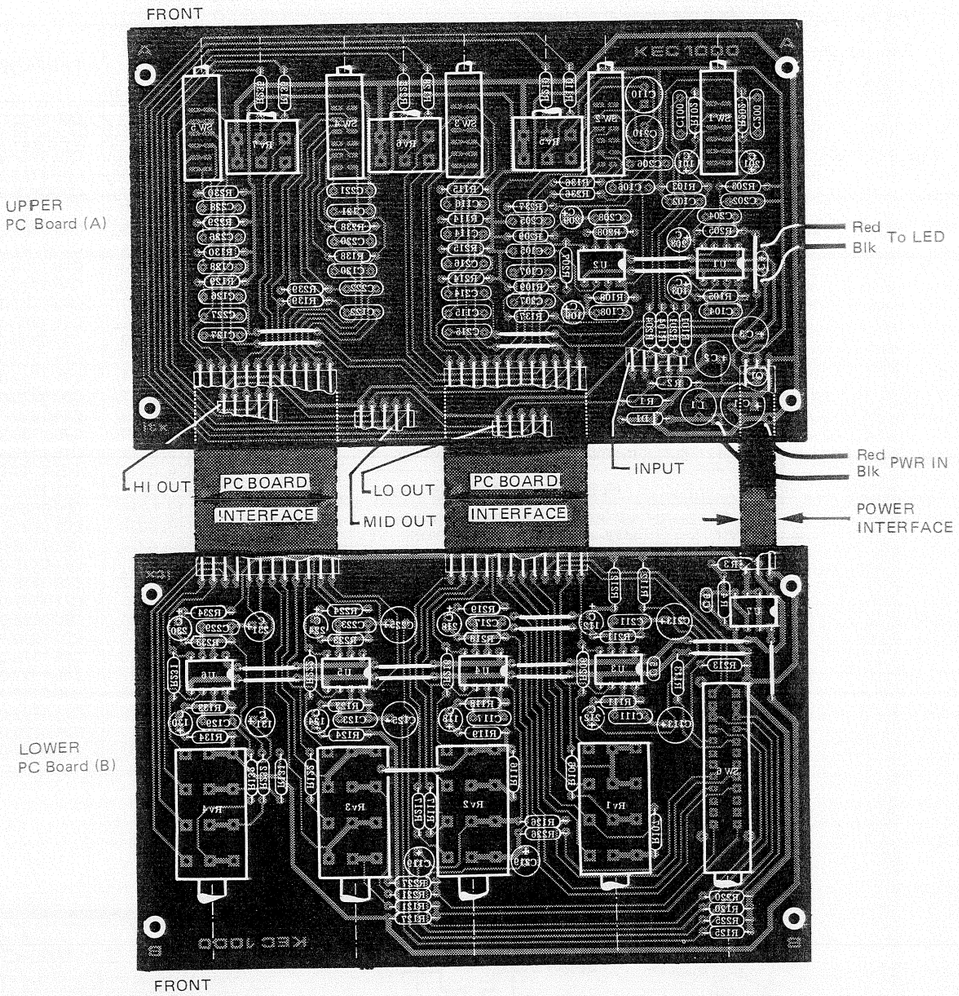
With the SLOPE push switches OUT, the filters are first order (-6dB/octave) tunable frequency filters and are followed by IC OpAmps having a 6dB voltage gain. With switches IN, they become Voltage Controlled Voltage Source (VCVS) second order (-12dB/octave) tunable frequency filters, each with a 6dB voltage gain.

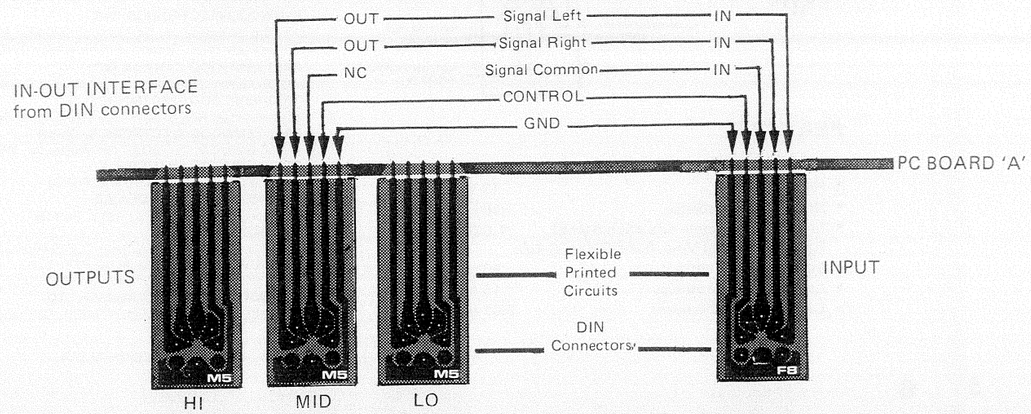
Low pass filters (LOW RANGE and MID HI) have a damping ratio of 1.0 to insure low overshoot in transient response. The high pass filters (MID LO and HI RANGE) have a damping ratio of 0.707 (Butterworth) for flatness of response.

All outputs are capacitively coupled into output level control potentiometers, preceeding respective output connectors.

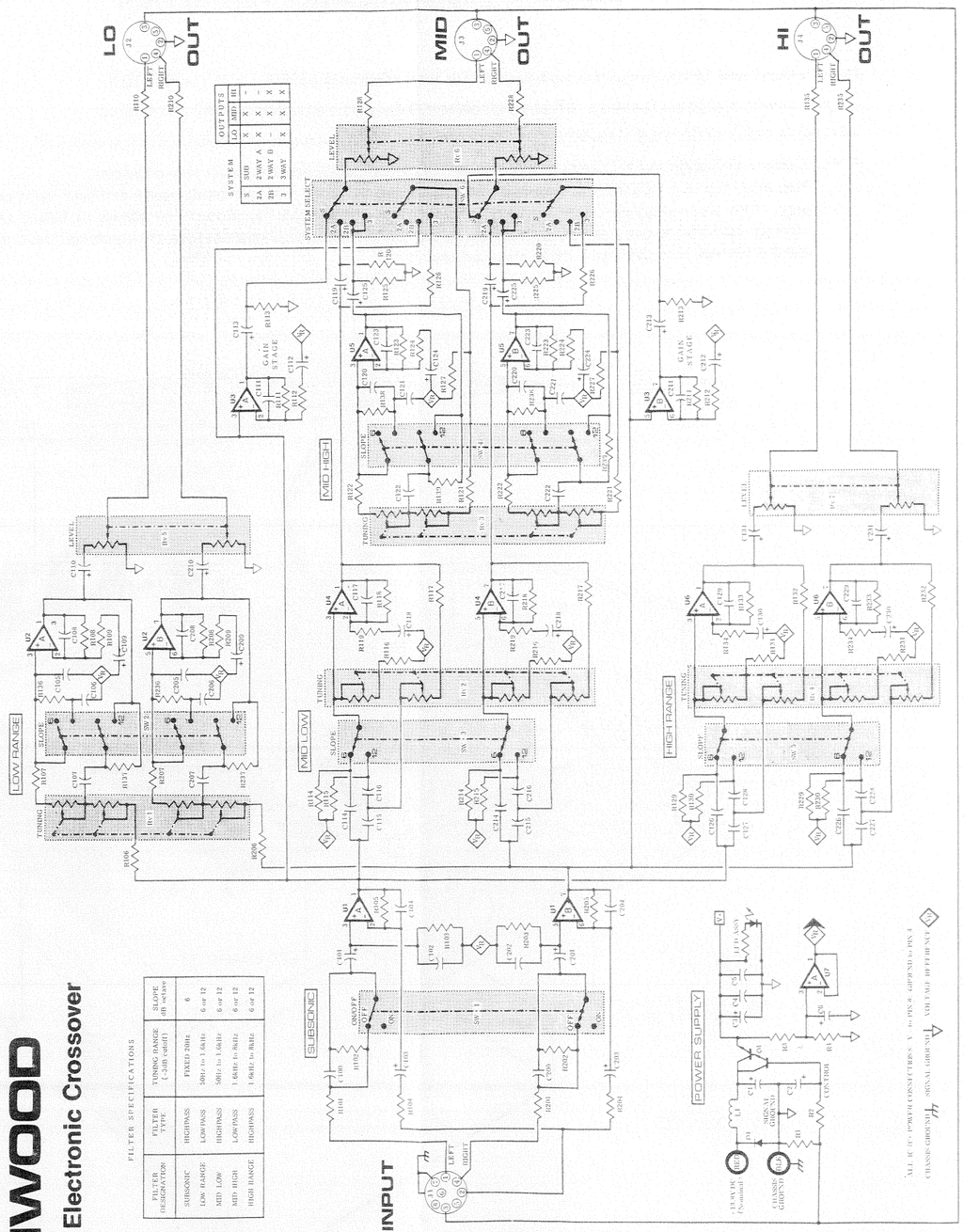
PC BOARDS

Foil side view. Boards are shown spread apart, joined by interface conductor assemblies.





SCHEMATIC



KENWOOD

KEC1000 Electronic Crossover

FILTER SPECIFICATIONS

FILTER DESIGNATION	FILTER TYPE	TUNING RANGE (-3dB cutoff)	SLOPE dB octave
SUBSONIC	HIGHPASS	FIXED 20Hz	6
LOW RANGE	LOWPASS	50Hz to 1.6kHz	6 or 12
MID LOW	HIGHPASS	50Hz to 1.6kHz	6 or 12
MID HIGH	LOWPASS	1.6kHz to 8kHz	6 or 12
HIGH RANGE	HIGHPASS	1.6kHz to 8kHz	6 or 12

COMPONENT VALUES

RESISTORS — 1/2W ±5%

R1 thru R4	10Kohm
R101, R201	9Kohm
R102, R202	1Mohm
R103, R203	15Kohm
R104, R204	910Kohm
R105, R205	1.5Kohm
R106, R206	1Kohm
R107, R207	10Kohm
R108, R208	10Kohm
R109, R209	10Kohm
R110, R210	10Kohm
R111, R211	10Kohm
R112, R212	10Kohm
R113, R213	47Kohm
R114, R214	470Kohm
R115, R215	470Kohm
R116, R216	1Kohm
R117, R217	10Kohm
R118, R218	10Kohm
R119, R219	10Kohm
R120, R220	47Kohm
R121, R221	11Kohm
R122, R222	11Kohm
R123, R223	10Kohm
R124, R224	10Kohm
R125, R225	47Kohm
R126, R226	2Kohm
R127, R227	470Kohm
R128, R228	150 ohm
R129, R229	470Kohm
R130, R230	470Kohm
R131, R231	11Kohm
R132, R232	11Kohm
R133, R233	10Kohm
R134, R234	10Kohm
R135, R235	150ohm
R136 through 139	1M ohm
R240 through 249	1ak ohm

VARIABLE

R1 to R4	50Kohm, 4-gang rotary attenuator
R5 to R7	500ohm, 2-gang linear taper

CAPACITORS

C1	470uF 16V el.
C4, C5, C6	0.1uF mono.
C100, C200	0.33uF mylar
C101, C201	470pF mica
C102, C202	47pF mica
C103, C203	22pF 16V el.
C104, C204	100uF 16V el.
C105, C205	0.033uF mylar
C106, C206	0.022uF mylar
C107, C207	0.02uF mylar
C108, C208	470pF mica
C109, C209	22uF 16V el.
C110, C210	100uF 16V el.
C111, C211	470pF mica
C112, C212	22uF 16V el.
C113, C213	100uF 16V el.
C114, C214	100uF 16V el.
C115, C215	0.1uF mylar
C116, C216	0.047uF mylar
C117, C217	470pF mica
C118, C218	22pF 16V el.
C119, C219	47uF 16V el.
C120, C220	0.0015 mylar
C121, C221	0.0015 mylar
C122, C222	750pF mica
C123, C223	47pF mica
C124, C224	22uF 16V el.
C125, C225	15pF mica
C126, C226	0.0018 mylar
C127, C227	0.0027 mylar
C128, C228	0.0012 mylar
C130, C230	22pF 16V el.
C131, C231	47pF 16V el.

KEC-1000

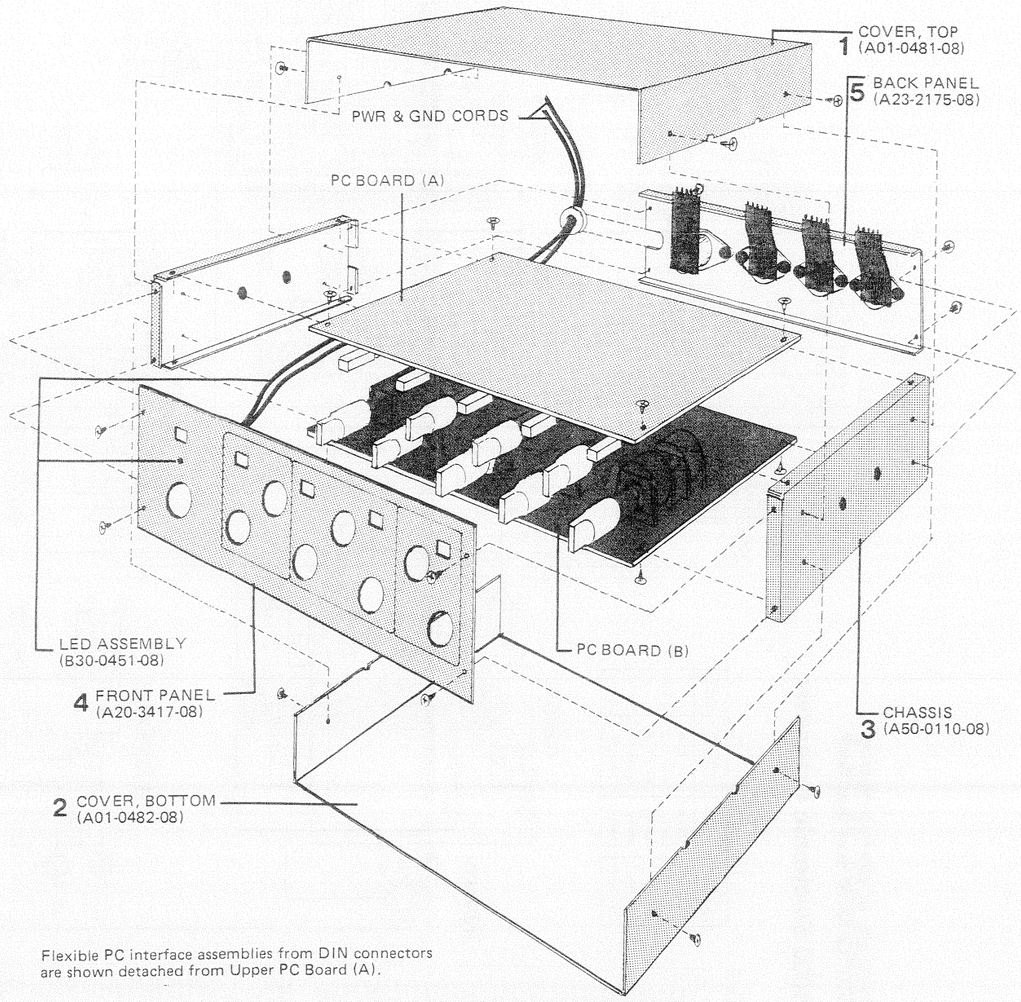
DISASSEMBLY FOR REPAIR

The exploded view below shows the main mechanical parts of the KEC1000.

In most service situations, however, only partial disassembly will be required.

FOR PC BOARD FOIL SIDE ACCESS, remove screws on sides of covers and slip off.

FOR PC BOARD COMPONENT SIDE ACCESS, pull off lower row of knobs.
The reafter remove LOWER PC BOARD (B) holding screws only and fold front edge of board away from assembly. The board will remain functionally attached to Board (A) via board interface assemblies along rear edge of both PC boards permitting powered testing and service, without further disassembly.



Flexible PC interface assemblies from DIN connectors are shown detached from Upper PC Board (A).

KEC-1000

PARTS LIST

Ref. No. page 1, photos, front & back panels

Ref. No. page 4, schematic

Ref. No. page 5, disassembly drawing

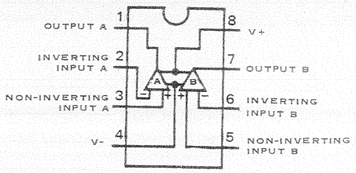
REF. NO. PAGE		PARTS NO.	DESCRIPTION
5	1	A01-0481-08	COVER, TOP
5	2	A01-0482-08	COVER, BOTTOM
5	3	A50-0110-08	CHASSIS
5	4	A20-3417-08	FRONT PANEL
5	5	A23-2175-08	BACK PANEL
-	-	J21-3218-08	MOUNTING BRACKET
1	1	K29-0924-04	KNOB, ROTARY
1	2	K27-0928-08	KNOB, PUSH
1	3	E30-0628-05	POWER CORD
1	4	E30-0623-05	GND CORD
-	-	B-50-4631-08	INSTRUCTION MANUAL
-	-	B51-1331-08	SERVICE MANUAL
-	-	H21-0217-08	UNIT CARTON
ELECTRONIC PARTS Ref. page 4			
U1-U7		LF-353-N	DUAL AMP(IC)
Q1		MPS-A13	TRANSISTOR
D1		1N4003	DIODE
LED		B30-0451-08	LED ASSY
L1		L33-0292-08	CHOKE COIL
Rv1-Rv4		R11-4025-08	VAR. RESISTOR 50K Ω x 4
Rv5-Rv7		R06-0002-08	VAR. RESISTOR 500 Ω x 2
SW6		S29-4015-08	SWITCH, ROTARY, 4W4P
SW1-SW5		S40-4049-08	SWITCH, PUSH, 2W4P
J1		E06-0803-08	DIN CONNECTOR, 8P
J2-J4		E06-0518-08	DIN CONNECTOR, 5P

Parts without PARTS NO. are not supplied.

REF. NO.	PARTS NO.	DESCRIPTION
C1	C90-0820-05	CAP. 470uf 16V el
C2, C3	C24-1210-77	CAP. 100uf 16V el
C4, C5, C6,	C90-0824-05	CAP. 0.1uf monolithic
C100, C200	C91-0114-05	CAP. 0.33uf mylar
C101, C201	C90-0825-05	CAP. 22uf 16V el
C102, C202	C71-1747-05	CAP. 47pf mica
C103, C203	C90-0825-05	CAP. 22uf 16V el
C104, C204	C71-1747-05	CAP. 47pf mica
C105, C205	C45-1733-36	CAP. 0.033uf mylar
C106, C206	C45-1722-36	CAP. 0.022uf mylar
C107, C207	C45-1727-35	CAP. 0.027uf mylar
C108, C208	C71-1747-05	CAP. 47pf mica
C109, C209	C90-0825-05	CAP. 22uf 16V el
C110, C210	C24-1210-77	CAP. 100uf 16V el
C111, C211	C71-1747-05	CAP. 47pf mica
C112, C212	C90-0825-05	CAP. 22uf 16V el
C113, C213	C24-1210-77	CAP. 100uf 16V el
C114, C214	C45-1768-36	CAP. 0.068uf mylar
C115, C215	C45-1710-45	CAP. 0.1uf mylar
C116, C216	C45-1747-36	CAP. 0.047 mylar
C117, C217	C71-1747-05	CAP 47pf mica
C118, C218	C90-0825-05	CAP. 22uf 16V el
C119, C219	C90-0822-05	CAP. 47uf 16V el
C120, C220	C91-0115-05	CAP. 0.0015uf mylar
C121, C221	C91-0115-05	CAP. 0.0015uf mylar
C122, C222	C48-1775-15	CAP. 750pf mica
C123, C223	C71-1747-05	CAP. 47pf mica
C124, C224	C90-0825-05	CAP. 22uf 16V el
C125, C225	C24-1210-77	CAP. 100uf 16V el
C126, C226	C46-1718-26	CAP. 0.0018uf mylar
C127, C227	C45-1727-25	CAP. 0.0027uf mylar
C128, C228	C45-1712-26	CAP. 0.0012uf mylar
C129, C229	C71-1747-05	CAP. 47pf mica
C130, C230	C24-0825-05	CAP. 22uf 16V el
C131, C231	C90-0822-05	CAP. 47uf 16V el

Operational Amplifiers

LF353N (Top View)



FEATURES

- Wide gain bandwidth 4 MHz
- High slew rate 13 V/us
- High input impedance 10^{12} Ω
- Low total harmonic distortion A_V=10, R_L=10k, V_O=20 Vp-p, BW=20 Hz–20 kHz < 0.02%
- Low input bias current 50 pA
- Low input noise voltage 16 nV/√Hz
- Low input noise current 0.01 pA/√Hz

A product of
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